UNIVERSITI TEKNOLOGI MARA

PHYSICAL AND ELECTROCHEMICAL STUDIES ON NANOCOMPOSITE -30 % PMMA-g-NATURAL RUBBER (MG30)

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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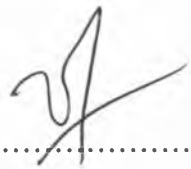
Signature of Student	:	
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ABSTRACT

This thesis focuses on the effect of nanofillers on the physical and electrochemical properties of polymer electrolytes. 30% PMMA-g-natural rubber (MG30) is doped with lithium triflate (LiTf) salt and composited with silicon dioxide (SiO_2) or aluminum oxide (Al_2O_3) nanofiller. The conductivity of the samples is measured by impedance spectroscopy (IS) and shows a substantial increase in conductivity with the addition of lithium salt up to 35 wt. % after which, at higher salt loading (> 35 wt.%) the conductivity seem to decrease. The optimum composition of MG30-LiTf salt complexes sample with highest conductivity is then separately composited with different concentrations of SiO_2 or Al_2O_3 filler. The addition of filler demonstrates a significant increase in conductivity by one order higher ($\sim 10^{-4}$ Scm^{-1}) to that of uncomposited samples. FTIR spectral analysis shows the complexation takes place between polymer and salt. The shifting of C=O vibration mode to lower wavenumber prove the $Li^{+} \rightarrow O{=}C$ interaction. X-ray diffraction (XRD) spectral studies shows the composited film exhibit most amorphous. Higher degree of amorphousness of the samples is well agreed with the surface morphology analysis that is the sample with addition of filler displayed most miscible with reduces in glass transition temperature (T_g). These effects are associated to the conductivity and the increasing in conductivity value is due to the increasing of the segmental chain flexibility that occurs mainly in the amorphous domain.

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